

MAR 07 2007

Attorney Docket No.: 351913-992740

REMARKS/ARGUMENTS

I. Claims 1, 4, 5, 8-11, 14-16, 18 and 19 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. patent 6,040,210 ("Burns"). Applicants respectfully traverse this rejection.

In applicants' invention as claimed in claim 1, a memory cell having a floating gate 20 is disclosed. The floating gate 20 has a tip 21. The tip 21 is a region where a tunnel material is located between the tip 21 and a control gate 26, to permit Fowler-Nordheim tunneling of charges from the floating gate 20 to the control gate 26. Finally, the claim, as now amended recites that the control gate 26 is "above the planar surface" 8 of the substrate.

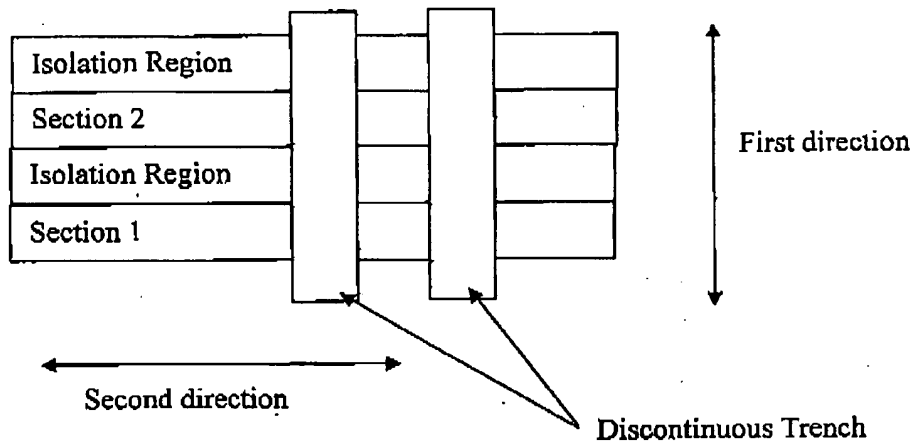
In rejecting independent claim 1, the examiner asserted, without any support, that Burns discloses a tip. The examiner merely pointed to the "top portion" of the floating gate 265 of Burns as allegedly disclosing this feature. Further, the examiner asserted that the control gate found in Burns is gate 275. However, there are two problems with this assertion. First, the control gate 275 of Burns is not above the planar surface of the substrate. Second, the tunnel material is not between the tip and the control gate permitting Fowler-Nordheim tunneling of charges from the floating gate to the control gate. Therefore for all of these reasons, applicants respectfully submit that the rejection of claim 1 based upon Burns is in error.

Claim 4, which depends upon claim 1 is patentable over Burns for the same reasons. To further clarify that the control gate 275 of Burns is not the control gate of applicants' invention as claimed, as amended herein, applicants have added new claims 25-26, which describe an assist gate inside the trench, capacitively coupled to the floating gate. Further, the assist gate is connected to the second region at the bottom of the trench.

With respect to independent claim 5, applicants' invention describes an array of memory cells. The array is divided into sections, with each section separated from one another by an isolation region, extending in a first direction. A plurality of discontinuous trenches are formed, in the first direction. The trenches are discontinuous because they are "interrupted" by the isolation region. Each section contains the memory cells and extend in the second direction. Similar to claim 1, within each trench region there are floating gates with each floating gate having a tip away from the bottom of the trench. Further, within each trench there is a first

Attorney Docket No.: 351913-992740

contact that electrically contacts the first region (located at the bottom of the trench) of a first section to the first region of a second section. Because the sections are separated by an isolation region, the first contact serves to electrically connect the first region at the bottom of the trench of one section with another section. The first contact is located between a pair of floating gates. Finally, the control gates extend in the second direction and is over the tips of the floating gate and insulated therefrom. The relationship between the first direction and the second direction is shown below.



In reviewing Burns, it is clear that Burns does not disclose each and every element of claim 5. In particular, Burns does not disclose at least the following:

- 1) Each floating gate of claim 5 recites a tip away from the bottom of the trench;
- 2) The tip of each floating gate of claim 5 is positioned to permit Fowler-Nordheim tunnel charges from the floating gate to the control gate which is located above or over the floating gate (not the control gate 275 shown in Fig. 11 of Burns, located adjacent to the floating gate 265 positioned in the trench);
- 3) The first contact 460 of Burns is not between a pair of floating gates, and does not connect the first region (at the bottom of the trench) of one section to the first region of another section. As shown in Fig. 16 of Burns, the strapping region 460 is continuous and electrically connects the source region 405 which is also continuous, and is shown in Figure 19 as being

Attorney Docket No.: 351913-992740

parallel to the isolation regions 210. Thus, the strapping region 460 does not "cross over" an isolation region.

4) As shown in Fig. 19 of Burns, the isolation regions are parallel in the "bitline" direction 314. The word line direction 312 is perpendicular to the isolation trench direction. The control gate 275 is disclosed as being in the word line direction (see col. 8, lines 52). Thus, the designation of "first direction" and "second direction" of Burns is different from that set forth in Claim 5, which recites that the control gate extends in a second direction.

Therefore, for all of these reasons, Burns does not anticipate claim 5. For the same reasons, Burns does not anticipate claims 8-9 which depend on claim 5.

With respect to the rejection of independent claim 10 based upon Burns, applicants respectfully submit that Burns does not anticipate for at least the following reasons:

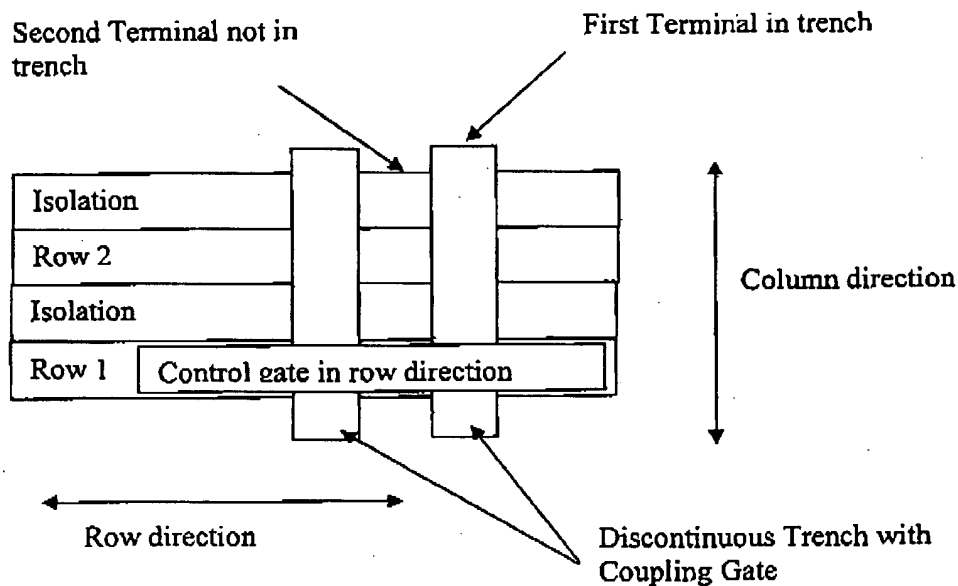
- 1) Each floating gate of claim 10 requires a tip away from the bottom of the trench;
- 2) The tip of each floating gate of claim 10 is positioned to permit Fowler-Nordheim tunnel charges from the floating gate to the control gate which is located above the substrate (not the control gate 275 shown in Fig. 11 of Burns, located adjacent to the floating gate 265 positioned in the trench);
- 3) The first contact 460 of Burns does not electrically connect the first region (at the bottom of the trench) of one section to the first region of another section, where an isolation region separates the two sections. As shown in Fig. 16 of Burns, the strapping region 460 is continuous and electrically connects the source region 405 which is also continuous, and is shown in Figure 19 as being parallel to the isolation regions 210.
- 4) As shown in Fig. 19 of Burns, the isolation regions are parallel in the "bitline" direction 314. The word line direction 312 is perpendicular to the isolation trench direction. The control

Attorney Docket No.: 351913-992740

gate 275 is disclosed as being in the word line direction (see col. 8, lines 52). Thus, the designation of "row" and "column" as used in claim 10 is different from that used in Burns.

Therefore, for all of these reasons, Burns does not anticipate claim 10. For the same reasons, Burns does not anticipate claims 11, and 14-15 which depend on claim 10.

With respect to claim 16, a pictorial representation of some of the elements of claim 16 is shown below.



Applicants respectfully submit that what is not shown by Burns is at least the following:

1. The coupling gate of Burns is not in a trench and does not electrically connect the first region (at the bottom of the trench) of one section to the first region of another section, where an isolation region separates the two sections. As shown in Fig. 16 of Burns, the strapping region 460 is continuous and electrically connects the source region 405 which is also continuous, and is shown in Figure 19 as being parallel to the isolation regions 210.
- 2) As shown in Fig. 19 of Burns, the isolation regions are parallel in the "bitline" direction 314. The word line direction 312 is perpendicular to the isolation trench direction. The control

Attorney Docket No.: 351913-992740

gate 275 is disclosed as being in the word line direction (see col. 8, lines 52). Thus, the designation of "row" and "column" as used in claim 16 is different from that used in Burns.

Claims 18-19 depend on claim 16. For the same reasons as discussed heretofore, applicants submit that these claims are also not anticipated by Burns.

If the Examiner feels that a telephone conference would speed the prosecution of this application, the Examiner is invited to call Applicants' attorney at the telephone number listed below.

The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment, to **Deposit Account Number 07-1896**, and reference Attorney Docket No. **351913-992740**.

Respectfully submitted,

DLA PIPER US LLP

Date: March 7, 2007By: 

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